



Oil-free and food-safe compressors guarantee high quality standards in the food industry.

Source: Adobe Stock

Compressors guarantee oil-free and food-safe compression

■ Jörg-Peter Mehrer

Health and safety aspects have a high priority in the food and beverage industry. Contaminated gases can lead to product rejects and a considerable health risk for the consumer. Oil-free and food-safe compression can ensure that the final product meets high quality standards. A new product series offers the right compressors for various applications and guarantees this.



In breweries, large quantities of the greenhouse gas carbon dioxide (CO₂) are released during beer production, known in this context as carbonic acid. The CO₂ is produced during alcoholic fermentation and is also required later for a number of downstream processes. Breweries use it to flush and thus clean pipes, as well as pressure and storage tanks. Another important area of application is pre-charging, in which CO₂ is used to build up a counter-pressure in tanks, kegs and bottles before the beer is filled, preventing the beer from foaming up and becoming stale during the filling process.

The gas produced in large quantities during alcoholic fermentation is often released into the atmosphere by breweries as CO₂ emissions. To cover their own needs, other companies in turn buy carbon dioxide for their own production processes. Unused or emitted carbon dioxide therefore has great potential for being recycled. The recovery of carbon dioxide can reduce production costs and greenhouse gas emissions. By using a CO₂ recovery system, companies are making their contribution to environmental protection.

CO₂ recovery in practice

As early as 1972, a small brewery in Belgium installed a CO₂ recovery system with oil-free piston compressors from Mehrer Compression GmbH in Balingen. As a result, the brewery reduced its CO₂ emissions by up to 80 per cent. The system was to be brought up to the latest technical standard in 2022. The brewery once again opted for reliable solutions from the German compressor specialist. As the compressor systems do not require expensive and high-maintenance filters for lubricants, there is no energy loss or waste to be disposed of in the form of filter elements.

CO₂ recovery is a crucial process for the Belgian brewery in order to guarantee the food-safe beer flavour and achieve the associated product quality. The carbon dioxide from the recovery process has a slight beer flavour anyway and is therefore particularly suitable for fizzing up their own drinks – more so than the tasteless and pre-filtered carbon dioxide from a gas supplier's lorry. In addition, in the latter case, the purity and origin of the carbon dioxide is often not entirely certain. Moreover, transport to the consumer

generates CO₂ emissions – another reason to strive for oil-free, food-safe and sustainable CO₂ recompression in your own company. Food-safe compression saves energy, reduces CO₂ emissions and sustainably reduces the CO₂ footprint in the value chain.

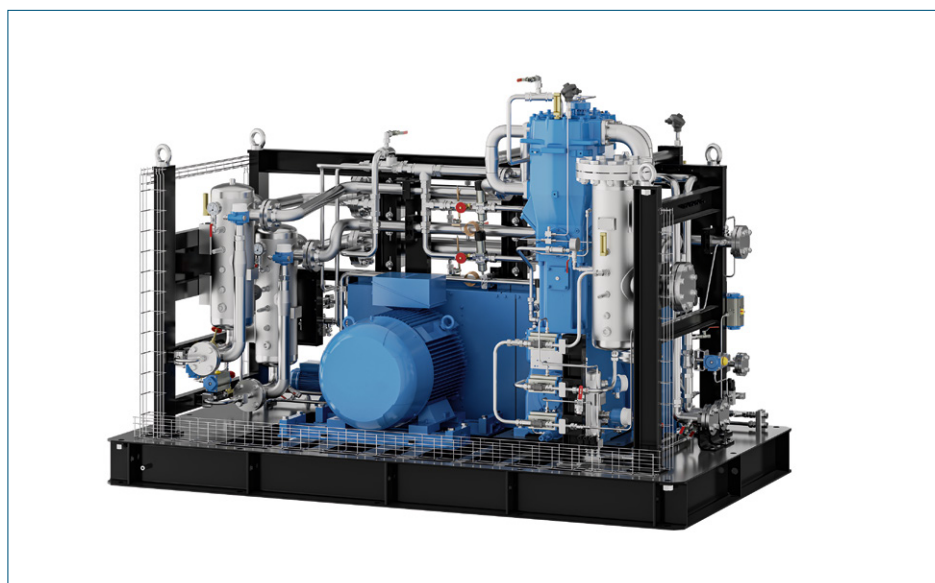
Reusing recovered carbon dioxide

The Belgian brewery's CO₂ recovery system allows the carbon dioxide produced during alcoholic fermentation to be recovered and used for subsequent business processes. The carbon dioxide produced is first collected in a gas balloon, filtered and stored. It is then compressed by an oil-free and food-grade piston compressor and supplied in liquid form in tanks. This allows the user to add the carbon dioxide back to the final beer product in a subsequent process or utilise it for downstream processes.

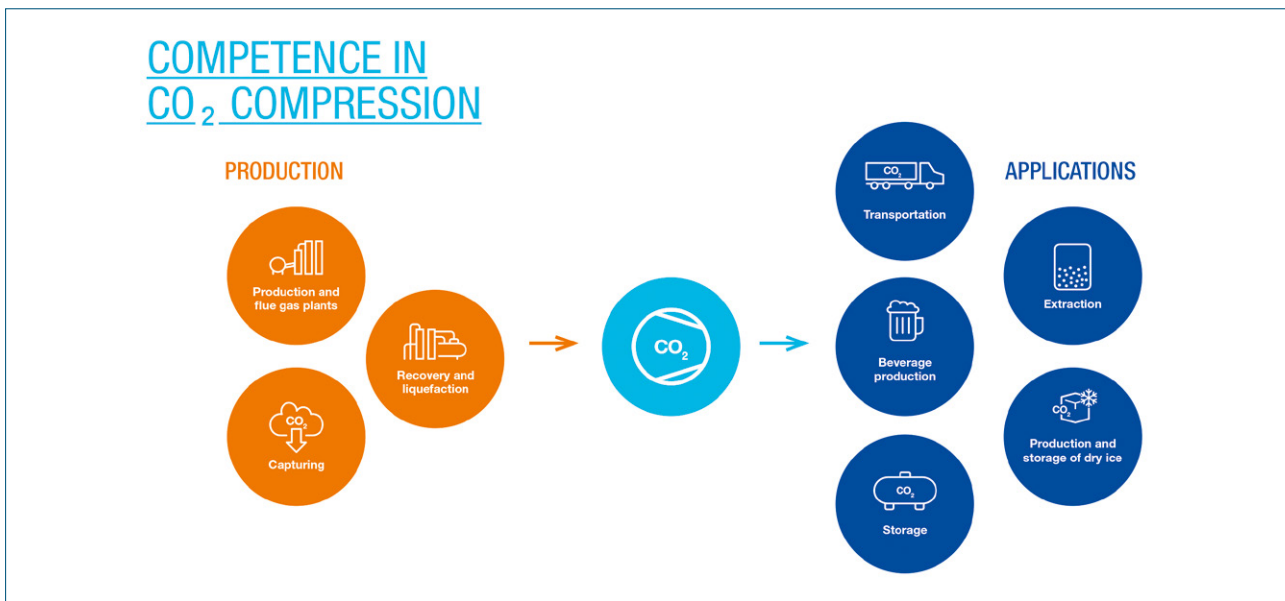
Dry ice production thanks to CO₂ compression

The CO₂ compressed by this process and made available in liquid form has yet another benefit, however. With the help of the Joule-Thomson effect, users can produce food-grade dry ice. During this process, the liquid CO₂ cools down to -78.5° Celsius as it expands, creating carbon dioxide snow – known as dry ice. This can be

Source: Mehrer Compression



This compressor is suitable for coming into contact with food.



Recovered carbon dioxide can be reused in a wide variety of ways.

pressed into various shapes, such as pellets, blocks or discs, and made available for further use.

Dry ice offers various advantages:

- It does not melt, but merely changes from a solid to a gaseous state. This means that direct vaporisation takes place without residues. In other words, no water is produced, as is the case with ice cooling, for example.
- Dry ice is also odourless and tasteless and achieves three times the cooling capacity of conventional ice.

- Dry ice has anti-bacterial properties, is non-toxic, non-flammable and inert.

These properties make dry ice suitable for a wide range of applications. It can be used for cooling food, pharmaceutical products and in medical applications. Dry ice can also be used in the chemical industry and in the cleaning sector due to its positive properties. There are already dry ice pressing systems that are driven electromechanically and therefore do not require any hydraulic oil. These systems are completely oil-free and suitable for safe use in the food sector. These machines are also particularly durable. They produce high-quality dry ice with a conversion rate of up to 45 per cent.

The Joule-Thomson effect

- The effect occurs when a gas or gas mixture undergoes a change in temperature due to a change in pressure.
- Gas expands when it is throttled. The gas volume and the mean particle distance increase, so that work (=force times distance) acts against the attractive forces between the particles. This means that a body is moved with force and receives energy that is extracted from its surroundings – in this case the gas. This reduces the energy of the gas, the particles become slower and the gas cools down.
- The effect is caused by attractive and repulsive forces between the particles of a real gas. The Joule-Thomson effect plays an important role in the thermodynamics of gases and is the basis for gas liquefaction.

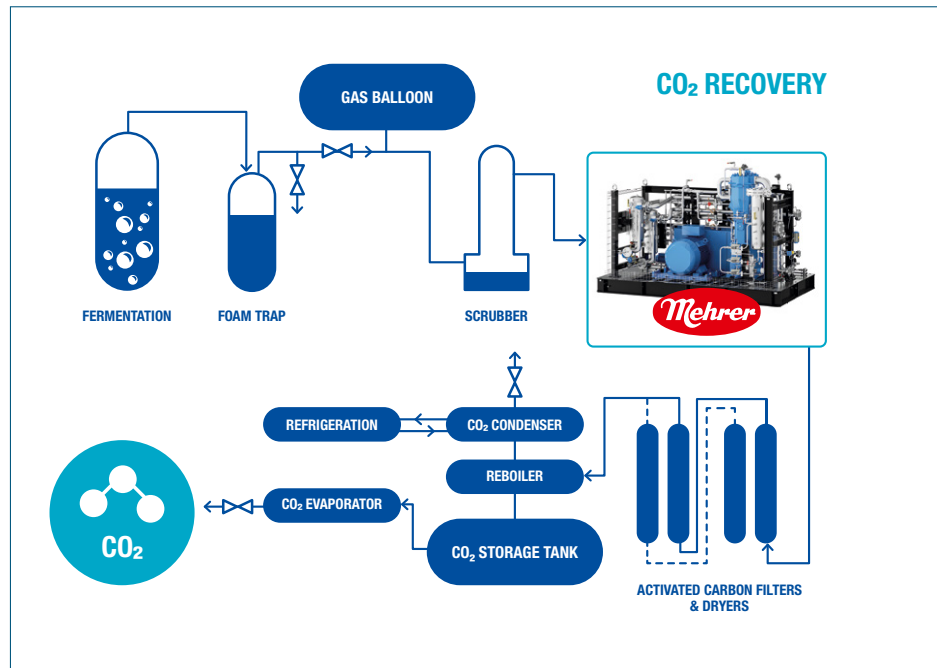
Source: <https://www.spektrum.de/lexikon/chemie/joule-thomson-effekt/4693> and https://www.chemeurope.com/en/encyclopedia/Joule-Thomson_effect.html



Food safety guaranteed

A growing challenge for the entire food and beverage industry is to provide safe food that is suitable for consumption and does not harm the health of consumers. Regulation (EC) No. 1935/2004 of the European Parliament stipulates that materials or items that come into direct or indirect contact with food must not contain any substances that could be harmful to human health. In this context, machines and systems must fulfil the requirements for food-compatible materials of Regulation No. 1935/2004.

The compressed air quality of a CO₂ recovery system for the food and beverage industry has a direct impact on the safety of food. Therefore, in the event of direct or indirect contact with the product, companies must ensure that there are no oil particles in the compressed air that could

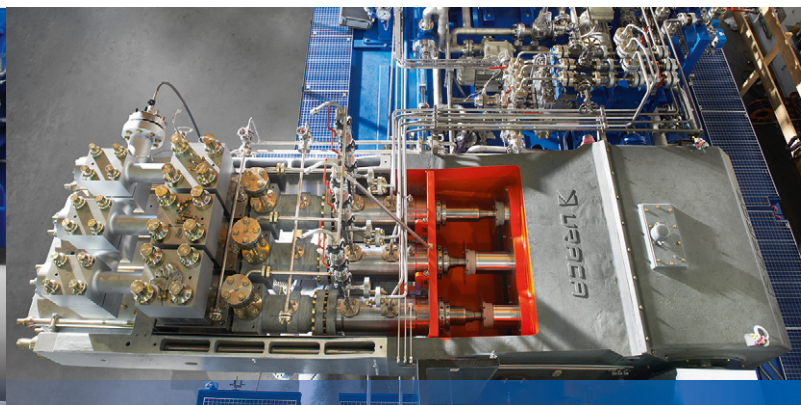
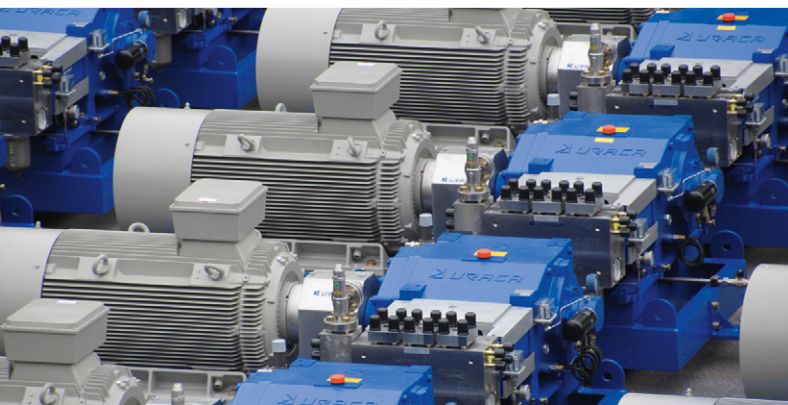


The CO₂ recovery system allows the carbon dioxide produced during alcoholic fermentation to be reused.

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Greenhouse gas emissions in Germany

Released greenhouse gas emissions threaten the atmospheric balance and lead to a rise in global temperatures.

- Total emissions in Germany in 2022 amounted to 746 million tonnes. This corresponds to a reduction of 1.9 per cent compared to the previous year.
- German greenhouse gas emissions fell by 40.4 per cent between 1990 and 2022.
- Germany's greenhouse gas emissions have to be reduced by at least 65 per cent compared to 1990 levels by 2030. The aim is to achieve complete greenhouse gas neutrality by 2045.
- In 2022, Germany only just achieved the target of minus 40 per cent greenhouse gas emissions set for 2020. Without massive and rapid additional efforts, the further goals will not be achieved either.
- The German Federal Climate Protection Act, which was amended in 2021, significantly reduces the sectoral emission levels for 2030 and brings forward the greenhouse gas neutrality target from 2050 to 2045. In order to achieve the climate protection targets, the German government is developing an emergency climate protection programme based on the Climate Action Programme 2030.

Source: <https://www.umweltbundesamt.de/en>

contaminate the food. These safety standards also apply to the production and use of dry ice. In order to guarantee an absolutely oil-free and food-safe process, users should rely on appropriately safe machines. This means that the compressed gas can be used without hesitation in downstream production processes – regardless whether that be for direct reutilisation of the carbon dioxide recovered or for further processing into dry ice.

Contribution to climate protection

Carbon dioxide is considered to be one of the causes of the greenhouse effect and global warming. The functional principle of CO₂ recovery systems therefore not only opens up good opportunities for economical and CO₂-self-sufficient operation. It also offers the opportunity to make a contribution to environmental protection in a sustainable and economically sensible way. A medium-sized brewery, for example, emits around 200,000 tonnes of CO₂ into the atmosphere for an annual production of 200,000 hectolitres of beer. By using a CO₂ recovery system, almost 100 per cent less carbon dioxide is released into the atmosphere, as it is a closed process. This contributes toward the energy revolution. With a continuous recycling process, companies can fulfil their commitment to sustainability and responsibility for the environment.

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Source: Mehrer Compression

A Belgian brewery reduced its CO₂ emissions by up to 80 per cent by using a CO₂ recovery system.

